

October 25, 2005

Mr. David H. Oatley, Acting Chief Nuclear Officer
Pacific Gas and Electric Company
Diablo Canyon Power Plant
P.O. Box 56
Avila Beach, CA 93424

SUBJECT: DIABLO CANYON POWER PLANT, UNIT NO. 2 - REVIEW OF STEAM
GENERATOR TUBE INSPECTION REPORTS FOR THE 2004 OUTAGE
(TAC NO. MC6718)

Dear Mr. Oatley:

By letters dated November 30, 2004 (available in the Agencywide Documents Access and Management System (ADAMS) under Accession No. ML043430465), March 16, 2005 (ADAMS Accession No. ML050820052), and August 25, 2005 (ADAMS Accession No. ML052440285), Pacific Gas and Electric Company (PG&E) submitted reports summarizing several aspects of the steam generator tube inspections performed at the Diablo Canyon Power Plant (DCPP), Unit No. 2, during the 2004 twelfth refueling outage (2R12). Additional information concerning these inspections was summarized in the Nuclear Regulatory Commission (NRC) letter dated January 4, 2005 (ADAMS Accession No. ML043570323).

As discussed in the attached evaluation, the NRC staff concludes that PG&E has provided the information required by the DCPP technical specifications. In addition, the NRC staff did not identify any technical issues that warrant follow-up action at this time.

If you have any questions regarding this matter, please contact me at (301) 415-8439.

Sincerely,

/RA/
Girija S. Shukla, Project Manager, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-323

Enclosure: Evaluation

cc w/encl: See next page

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EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
OF THE STEAM GENERATOR INSPECTION REPORTS
PACIFIC GAS AND ELECTRIC COMPANY
DIABLO CANYON POWER PLANT, UNIT NO. 2
DOCKET NO. 50-323

1.0 INTRODUCTION

By letters dated November 30, 2004 (available in the Agencywide Documents Access and Management System (ADAMS) under Accession No. ML043430465), March 16, 2005 (ADAMS Accession No. ML050820052), and August 25, 2005 (ADAMS Accession No. ML052440285), Pacific Gas and Electric Company (PG&E, or the licensee) submitted reports summarizing several aspects of the steam generator tube inspections performed at the Diablo Canyon Power Plant (DCPP), Unit No. 2, during the 2004 twelfth refueling outage (2R12). Additional information concerning these inspections was summarized in the Nuclear Regulatory Commission (NRC) letter dated January 4, 2005 (ADAMS Accession No. ML043570323).

DCPP Unit 2 has four Westinghouse model 51 steam generators. Each steam generator contains 3,388 mill annealed Alloy 600 tubes. Each tube has a nominal outside diameter of 0.875-inch and a nominal wall thickness of 0.050-inch. The tubes were explosively expanded for the full length of the tubesheet with the Westinghouse Explosive Tube Expansion (WEXTEx) process. The tubes are supported by a number of carbon steel support plates.

The licensee implements alternate tube repair criteria for degradation within the tubesheet region (W-star), outside diameter stress corrosion cracking (ODSCC) at the tube support plate elevations, and primary water stress corrosion cracking (PWSCC) at the tube support plate elevations.

2.0 STAFF EVALUATION

The licensee provided the scope, extent, methods, and results of their steam generator tube inspections for implementation of these alternate tube repair criteria in the documents referenced above. The licensee also described corrective actions (e.g., tube plugging) taken in response to the inspection findings.

As a result of the review of the reports, the NRC staff has the following comments/observations:

1. Approximately 100 tubes were identified with PWSCC at the plug expansion zone in tubes that were deplugged and returned to service. The plug expansion zone is the region of the tube where the plug was expanded into the tube. This expansion occurs in the region of the tube where the original shop hard roll was installed. The cause of the

plug expansion zone PWSCC was attributed by the licensee to the sensitization of the tube material from the tungsten inert gas (TIG) plug removal process, because the cracking is limited to the expanded location of the plugs and is limited to tubes that have been unplugged using the TIG process. The inspection of tubes that had been unplugged with a drilling process showed no evidence of PWSCC at the plug expansion zone. Tubes with PWSCC at the plug expansion zone may remain in service under the W-star (W*) alternate repair criteria. For the one tube requiring repair (for another reason), Framatome long-rolled plugs were used in both the hot- and cold-leg.

2. The computer code for determining the burst pressure for PWSCC indications at tube support plate intersections only provides the actual burst pressure of the indication when it is estimated to be less than 6100 pounds per square inch (psi). When the burst pressure is estimated to be greater than 6100 psi, the computer code indicates the burst pressure is "greater than" 6100 psi. Assessing whether the burst pressure predictions are conservative, even when the burst pressures are high (e.g., above 6100 psi), may give timely notification that the methodology is not conservative or that additional data is needed to quantify the uncertainties in the various correlations (e.g., in the non-destructive examination uncertainty distributions used in the calculations).
3. The cycle-12 growth data was supplemented with cycle 11 data for those indications which were greater than 1.2 volts at beginning of cycle 11. This was done because all indications greater than 1.2 volt were plugged during 2R11 (2003). The NRC staff notes that similar adjustments may need to be performed during the assessment of growth rates following the next inspection since the most conservative growth rate distribution from the previous two inspections is to be used in tube integrity assessments according to the guidance in NRC Generic Letter 95-05.
4. Chemical cleaning was performed in all four steam generators during the 2R12 (2004) outage. An assessment of the effect of chemical cleaning on the beginning of cycle voltage distribution and on the voltage growth rates was performed and it was concluded that the chemical cleaning would not affect the ODSCC signals.

Based on a review of the information provided (as discussed above), the NRC staff concludes that the licensee has provided the information required by the DCPD technical specifications. In addition, the NRC staff concludes that there are no technical issues that warrant follow-up action at this time since the inspections appear to be consistent with the objective of detecting potential tube degradation and the inspection results appear to be consistent with industry operating experience at similarly designed and operated units.

Principal Contributor: K. Karwoski

Date: October 25, 2005

Diablo Canyon Power Plant, Units 1 and 2

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